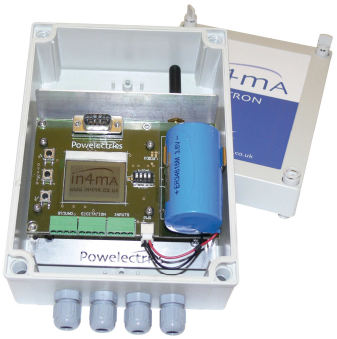
IN4MA Metron

GSM/GPRS Telemetry Solution

Technical Manual and Specification

Revision 0.99b 0908

Sept 2008



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METRON FIRMWARE REVISION HISTORY

Version	Date	Comments
0.94	17/08/06	Added continual monitoring functionality
0.95		corrected scaling issue with 4-20mA option
0.96		refined scaling issue with 4-20mA option
0.97		allowed 12-14 digit numbers to be used. corrected constant monitoring routine programming issue (65535)
0.98		allowed 4-14 digits for the phone number. implemented reset command for modem to improve reliability. corrected constant monitoring power save feature in powe down (65536 -> 65535) changed wait to response from modem to 5 changed the way the command received is printed on display
0.99	12/07/07	corrected low power issue. Improved display of received texts. deleted 2 second delay on intro. display signal strength when receiving text. added 'about' text. added 'initialising' message upon new board start up. sorted menu bug where it goes into system straight away. made menus more responsive. remove second number when going to 'read now' (0 - 1023). removed tamper & serial from menu. reduced delay when powering off modem. Fixed node_tag display issue.

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WARNINGS

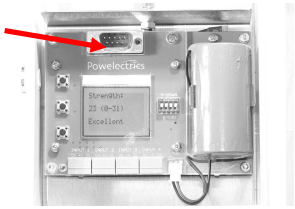
Safety

Read carefully these instructions and notes before powering IN4MA Metron. For each situation please follow the specific instructions.

The Metron is a low power radio transmitter and receiver. When it is powered, it will send and receive radio frequency (RF) signals.

Operating the Metron close to other electrical equipment such as television, phone, radios and personal computer, may cause interference.

DO NOT CONNECT ANYTHING TO THE 9 PIN D TYPE CONNECTOR ON THE FRONT OF THE BOARD WITHOUT PRIOR APPROVAL FROM POWELECTRICS LIMITED.



Interference

The Metron, like all wireless devices, is subject to interferences that may reduce its performance.

Road Safety

Do not use the Metron while driving. In case of use on cars, it is necessary to check that electronic equipment is shielded against RF signal. Do not place the Metron over the air bag or in the air bag deployment area.

Hospital Safety

Do not use the Metron near health equipment, especially pacemaker and hearing aids, to avoid potential interferences. The Metron is a not mobile phone; do not use it in direct contact with the human body. Switch it off in hospitals, and in any other type of medical centre. Hospitals or health care facilities may be using equipment that could be sensitive to external RF energy.

Explosive Materials

Do not use the Metron in refueling points, near fuel or chemicals. Do not use the Metron where blasting is in progress. Observe restrictions, and follow any regulation or instruction.

Do not use the Metron in direct contact with the human body; do not touch the antenna if not necessary when the Metron is powered. Use approved accessories and batteries only. Do not connect incompatible products.

Battery Information and safety

- Do not use if the battery casing appears damaged
- Do not attempt to recharge the battery
- Do not short circuit
- Only use supplied battery with the IN4MA Metron

The battery is a high energy density sealed battery containing dangerous (Lithium) and deleterious (Thionyl Chloride) materials. For this reason, improper handling of the battery could lead to distortion, leakage, overheating, explosion, fire, or generation of irritating/corrosive gases, causing bodily injury or equipment trouble. Please observe the following instructions to prevent accidents.

Do not use if you suspect any damage to the casing, cabling or connector.

Do not connect to a Metron when the programmer is connected.

Be careful not to drop – if dropped please do not use.

Do not short circuit the battery – if you suspect this possible then disconnect and do not use.

Do not apply heat to the battery.

Do not expose the battery to open flames.

Never disassemble the battery.

Never deform the battery.

Do not reverse polarity the battery – take extra care to ensure connections are the right way round.

Do not connect 2 or more batteries together.

Do not store the batteries in direct sunlight.

Store batteries in non conductive trays (e.g. plastic, wood or cardboard).

Do not use near water.

Do not have rings on your fingers when handling batteries, otherwise wear insulating gloves.

First aid measures:

Only in case of contact with internal components of the battery:
Skin contact: flush with plenty of water
Eye contact: flush with plenty of water (eyelids held open)
Inhalation: breath fresh air and give oxygen or artificial respiration by specialist people
Ingestion: drink much water and consult a doctor

Fire fighting measures:

Evacuate the building and leave it to the professionals. Advise the fire fighters that there are batteries in the building and the advice is to use extinguishers type D, Lith-X, DO NOT USE WATER in case of battery leakage
Special hazards: irritating vapour

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Special protective equipment: wear protective clothing, use self-contained breathing apparatus with filtered cartridge type ABEK

Leakage measures

In case of break of a battery, all the people must go away from the place where the incident happened and come back only after the dissolution of the irritating gas.
Broken batteries or battery packs must be covered with sodium carbonate (Na2CO3) or dry sand, place them in approved container and dispose in accordance with local regulation.

Disposal

Please return batteries to Powelectrics for disposal. Ensure suitable packaging in used. Do not use air freight.

Replacing the Battery

The battery used in the Metron must be supplied by Powelectrics Ltd. Its warranty will be void if any other battery is used as it may damage the Metron or cause it to malfunction.

To remove the battery, simply remove the plug from the PWR socket – Do not pull on the connecting wires. The battery can now be easily pulled from the retaining clip. Push the new battery into the retaining clip centrally, and then reconnect the plug to the socket on the Metron board.

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OVERVIEW

This document describes all the functions, features and interfaces of the IN4MA Metron telemetry device.

Applications

A few of the applications that this device has been designed for include:

- Remote Tank Level Monitoring
- Environmental Monitoring
- Meter Reading
- Condition Monitoring
- Alarm Reporting

Summary of Technical Features

- Ability to interface with up to four 0-10V or 4-20mA sensors
- On-board excitation
- Typically > 5 year battery life
- LCD Display to help with on-site setup
- Tri-band operation

As the Metron is a battery powered device it has been designed in such a way to extend this life to a maximum. This means during normal operation the display will be off, the sensors excitation will be off and the GSM engine will be powered down. As required these are switched on by the processor and when finished with they are switched off.

GENERAL DECRIPTION OF OPERATION

Normally the unit will be 'asleep' with just the processor running. The processor will wake up various components as and when required. For example, the processor will provide an excitation voltage of 21 volts to sensors before taking a reading – the length of time the processor gives for a sensor to settle to an accurate reading is configurable. The processor will also provide a wetting voltage of 3.6 volts for digital signals as and when required. When the Metron needs to communicate over the mobile phone network it will power up the GSM module (this takes a minute or 2 as the module needs to register onto the network – it's like switching on your mobile phone). Whilst the modem is powered it can receive messages for changing the configuration. The LCD screen shows the actions the Metron is performing.

The Metron will send text messages to your mobile phone, Sigma (our pc based software solution) or Gateway (our internet based reporting and alarm handling solution). The Metron can send messages periodically and/or on alarm.

NAVIGATION BASICS

A common method is used throughout the menu system for navigation.

To move up within a menu – You must use the top button to the left of the screen (*UP*) to move up if you are navigating in a menu.

To move down within a menu – You must use the bottom button to the left of the screen (*DOWN*) to move down if you are navigating within a menu.

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To select an item on a menu – You must press the central button to the left of the screen (*ENTER*) for less than one second to select an item if you are within a menu.

To go to the previous menu – You must press the central button to the left of the screen for more than one second to return to the previous menu. You should continue to hold until the previous menu appears.

To return to the previous menu when displaying information – If the Metron is just displaying information, you can return to the previous menu by simply pressing the central button to the left of the screen briefly.

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GETTING STARTED

1. Open the packaging

Cut the seals from the box and open the cardboard lid

2. Remove the lid

Using a large Phillips screwdriver, remove the four screws fastening the plastic lid to the enclosure and remove the lid

3. Fit the SIM card

Remove the four outer screws from the circuit board and tilt the circuit board 90 degrees to the right

Carefully remove the antenna cable from the circuit board – do not use excessive force.

Slide the SIM card into the SIM card holder. The final position is drawn onto the circuit board.

Re-attach the antenna cable and fasten the circuit board using the four outer screws.

4. Power up the unit

Visually inspect the battery and cable condition to ensure no damage. If in doubt do not use. Place the battery into the clip and connect the power connector.

5. Program the unit

The Metron can only be programmed by sending text messages.

The Metron config tool can help you create the messages you need to send. If you have a suitable mobile phone and software then you can copy and paste the messages as required.

You can only send one command at a time.

Using the Metron configuration tool, select the configuration you would like the Metron to operate in. Holding your mouse over any option will present more information about the parameter. The default password is 'oli'.

When you have fully completed this, click 'Generate Text Messages'. If there are no errors, you will be presented with several lines in the white box at the bottom of the window.

Each of the generated commands must then be sent via text message to the correct number for the Metron.

Alternatively please go to the Programming Specification section to define the text messages you want to send to the Metron and send from your mobile phone.

On the Metron - Press the (ENTER) button to 'wake up' the Metron, go to 'System' and then go to 'Get Config'. The display should read 'Waiting for Messages..' after it has established You must wait until each of the text messages sent has been received and successfully interpreted – It will display 'Success' or 'Invalid Command' in each case.

When all the messages have been received, press and hold the central button until you are returned to the main menu. If you leave the unit unattended for 20 minutes it will go into sleep mode.

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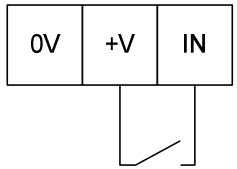
6. Connect inputs & test

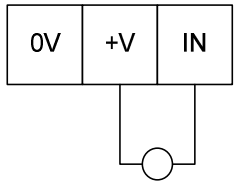
For each input that you have programmed, connect the required sensor and navigate to the relevant input settings. Choose the 'Read Now' option to see a real time scaled reading from the sensor.

If the scaling is not correct, these can be changed using the H-Scale and the L-Scale menu items on the previous menu.

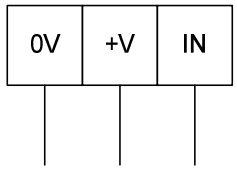
Volt free contact connections



4-20mA 2 wire sensor that requires power connections



0-10 Volt DC 3 wire sensor connections



7. Put the Metron to sleep

Return to the main menu then press and hold the central button until it displays 'Sleeping..'. The Metron will now be operational.

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CONNECTIONS

Serial Port

This port is for internal use at Powelectrics only.

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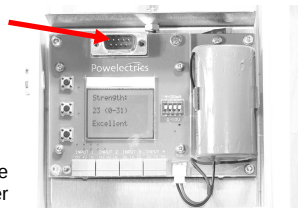

PWR

This socket should only be used for connecting the battery to the board. It is polarised – It should be impossible to connect the power incorrectly. Ensure that a secure connection is made. When you remove the connector, do not pull using the wires as this may impair the electrical connection.

DIL Switch

Each of the 4 (labelled 1, 2, 3 and 4) switches in this bank should be set according to the type of sensor used on the appropriate channel, either 4-20mA or 0-10V. The bottom position is 0-10V, while the top position is 4-20mA. If there is no sensor connected, it does not matter which position the corresponding switch is set to.

INPUT 1, 2, 3 and 4

Each sensor or connected input has its own plug and corresponding socket. On each socket, three connections are available.

INPUT 1			INPUT 2			INPUT 3			INPUT 4		
0V	+V	IN	0V	+V	IN	0V	+V	IN	0V	+V	IN

0V

This is the 0V / -Ve connection for the channel, although they are all common to each other.

+V

This will provide the supply voltage to the channel. This is configurable to either 21V or 3.6V. It is important that the load on this does not exceed the specifications.

IN

This is the input for the channel – This will accept 0-10V or 4-20mA.

Note: It is important that the channel used for the sensor excitation and the sensor inputs are the same. The connection to ground is not channel dependant.

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PUSHBUTTONS

These are used in conjunction with the display in order to access and navigate the menu system.

INSTALLATION

The Metron comes pre-assembled with the appropriate battery fitted, but not connected.

To achieve optimum performance from the unit, it is advised that the following guidelines are followed during the installation:

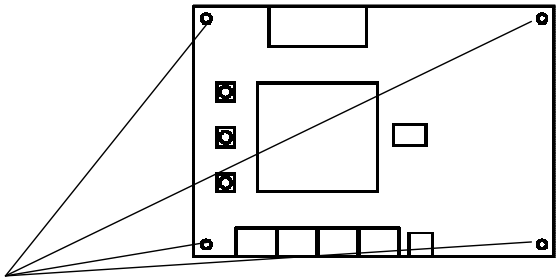
- To achieve optimum signal strength, the Metron must be mounted upright, with the label reading the correct way up
- Large metal objects that are in the transmission path of the Metron may hinder the performance
- Check that the glands are tightened and any blanking plugs are fitted tightly. The inside of the unit must remain dry, as water ingress may damage the Metron.

ANTENNA

The Metron comes with an antenna attached. The system has been designed to gain optimum signal strength to the mobile phone network but it is possible to use an external antenna. The Metron presents an SMA type connector for the antenna and the cable can be connected into the enclosure via one of the glands.

SIM CARD

The SIM card holder is located beneath the circuit board and can only be accessed by removing the circuit board. The circuit board is removed by unscrewing the 4 outer Alan screws. These screws need to be removed in order to gain access to the SIM card holder. When removing the circuit board, remove the antenna cable carefully with a firm grip.



Check with your GSM provider if your SIM is enabled. Ensure there is no pin code protecting the sim. If you are using ‘pay as you go’ ensure that you have credit on your SIM, and that you do not have a minimum usage to maintain operation.

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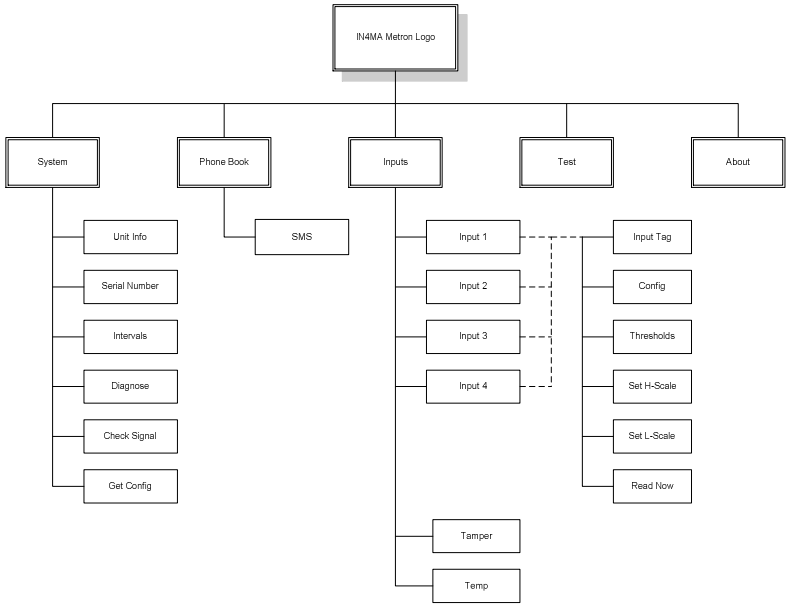
THE MENU STRUCTURE

Below is a diagram of how the menu system is structured. Each menu item has its function described in the table below the diagram.



Menu Item	Function
Unit Info	Displays the Unit Name and the Firmware Version. The firmware version may be requested if you contact Powelectrics for support.
Intervals	Displays the wakeup and transmit interval.
Diagnose	A self diagnostic function that allows the user to determine if there are any problems and where they may lie. For each of the checks, it will return 'Pass' or 'Fail'. SIM: This checks to see if the SIM card is present and if the SIM card has PIN protection. REG: This checks for correct network registration. If it is on the home network or on a roaming network and is connected correctly, it will return 'Pass'. SIG: This checks the signal strength and returns 'Pass' if the signal is strong enough for the Metron to operate reliably. IMEI #: The IMEI number is displayed for your reference.
Check Signal	This feature logs onto the network and monitors the signal strength. It displays the signal (0 – 31 or 99) and an interpretation of this so you can evaluate if the signal will be adequate or not. No Signal: There is extremely little or no signal available to the Metron. It will be unable to operate in these circumstances. Very Poor: There is a poor signal available to the Metron and the ability to operate successfully may vary according to weather conditions. Marginal: There is a signal available that can generally allow reliable operation of the Metron. Signal OK: The signal is well above operational levels. Excellent: The signal is very good – optimum conditions for successful Metron operation. Note: If you do not have a SIM card present in the Metron, this function will still operate but instead will read the signal strength of the strongest operator signal present.
Get Config	To configure the Metron via text message, you must first put the Metron into configuration mode. By selecting 'Get Config', it will do this and interpret any text messages that are received.
SMS	When selecting the SMS Phonebook, it will display the four numbers that are present in the Metron phonebook. If a number has not been programmed, it will show 'No Number' by the corresponding entry.
Input 1, 2, 3, 4	When selecting any of the inputs, it will bring up a sub-menu that directly corresponds to the input that has been selected.
Input Tag	This will display the name that has been given to the input. It will also confirm that the input is enabled.
Config	This will display what voltage the output is set to (3.6V or 21V), what the input type is set to (0-10V or 4-20mA) and the value of the settle

	time.
Thresholds	The four thresholds (hihi, hi, lo, lolo) and hysteresis will be displayed. You can then edit the value of each by using the up and down buttons. When you have finished modifying the value, by pressing enter you will move onto the next value. Once you have modified all of the values, press enter again to return to the previous menu. Each threshold can be used to set points that trigger alarms. They are described below. HiHi and Hi: These are triggered when the reading crosses from below to above the threshold. LoLo and Lo: These are triggered when the reading crosses from above to below Hysteresis: See separate section for details.
Set H-Scale	The high scale value will be displayed with the ability to adjust its value by pressing the up and down buttons.
Set L-Scale	The low scale value will be displayed with the ability to adjust its value by pressing the up and down buttons.
Read Now	This allows real time monitoring in an oscilloscope style format – The scaled value (based on the high scale and low scale) is displayed in the upper left hand corner. This can be useful for resolving and testing scaling issues.
Temp	This will display the temperature of the current environment.
Test	The test function will take raw readings and then scale them on all enabled channels.

CONFIGURATION

The first stage is to identify exactly what your requirements are to minimise the possibility of making mistakes in the configuration. It is advised that the system is carefully thought out before you start programming.

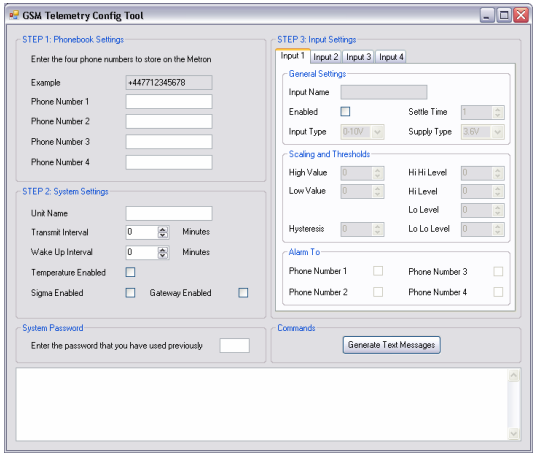
Using the IN4MA Metron Configuration Tool

The IN4MA Metron configuration tool is designed to simplify the process of generating the commands to program the Metron unit. It is strongly advised to all customers that they use this tool as support from Powelectrics will be given referring to this tool. You can freely download the software from www.in4ma.co.uk

When using the tool, a helpful description is given if you hold your mouse over any checkbox or text box.

The programming falls into several simple stages. You configure the unit, giving it a name, telling it how often it powers the sensor and looks at the inputs, and how often it sends a periodic text message. The next stage is programming the inputs, giving each channel a name, scaling it and assigning alarm levels if required.

A screen shot of the program is shown below



Example #1

The first example is a simple alarming application for normally open volt free contacts.

A volt free contact is being used to represent the state of an intruder alarm, while a second volt free contact is being used to represent the state of a fire alarm. The contacts are normally open when the system is operating normally, and are closed when triggered.

Requirements:

- When either of the alarms is triggered, a text message must be sent with the name of the alarm triggered and the state.
- The text messages must be sent to two numbers.
- The state of both alarms must be checked at least once a minute.
- The state of both alarms must be sent to one of the mobiles once a week regardless of alarm state.

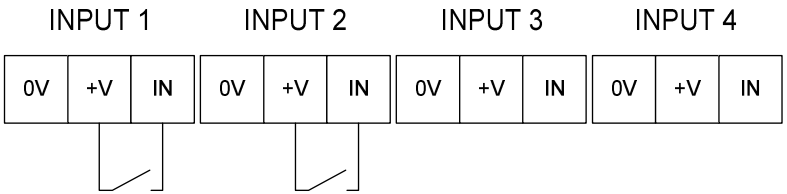
Configuration:

In this example, we will use the Windows based configuration tool to simplify the process and prevent mistakes being made it the construction of the programming commands. If you wish to understand the construction of the programming commands, please refer to the Programming Specification.

We will use +447771111111 and +447772222222 in our example. +447771111111 will be used to receive the weekly log of the input states.

The value '5' for either of the alarms will represent a triggered state, and 0 represents a non-triggered state.

The fire and intruder alarm are wired into input 1 and 2 with the DIL switch set to 0-10V for both inputs.



Example #1 Settings

Entry	Value	Notes
Phone Number 1	+447771111111	Phone Number 1 is always the number that will be transmitted to upon a transmit interval.
Phone Number 2	+447772222222	
Phone Number 3	Leave blank	
Phone Number 4	Leave blank	

Entry	Value	Notes
Unit Name	system_1	
Transmit Interval	10080	60 * 24 * 7 = 10080 Minutes
Wake Up Interval	1	Check every one minute
Temperature Enabled	Not Checked	

Parameter	Input 1	Input 2	Input 3	Input 4	Notes
Enabled	Checked	Checked			
Input Name	Intruder	Fire			
Settle Time	1	1			
Input Type	0-10V	0-10V			
Supply Type	3.6V	3.6V			
High Value	29	29			
Low Value	0	0			
Hi Hi Level	5	5			
Hi Level	0	0			Only one threshold required
Lo Level	0	0			Only one threshold required
Lo Lo Level	0	0			Only one threshold required
Hysteresis	0	0			
Phone Number 1	Checked	Checked			
Phone Number 2	Checked	Checked			
Phone Number 3	Not Checked	Not Checked			
Phone Number 4	Not Checked	Not Checked			

Notes:

(10 / (3.6 - 0.7)) * 10 = 29 - This is so that the 3.6V supply will equate to 10 when scaled.

Generated Text Messages

```
oli.1.+447771111111.+447772222222.

oli.2.system_1.10080.1.0.0.

oli.3.1.intruder.1.0.0.0.29.0.0.0.5.0.1.1.0.0.

oli.3.2.fire.1.0.0.0.29.0.0.0.5.0.1.1.0.0.
```

Example #2

Tank Level Monitoring

An ultrasonic sensor is being used to check the level of a fluid inside a tank. The ultrasonic sensor has a supply range of 14-24V and a min/max range of 200mm (0V output) / 2000mm (10V output). It requires three seconds to gain a reliable reading on the 0-10V output. 250mm is equal to 400 litres and 1500mm is equal to 0 litres.

Working:	y = mx + c	(y = litres, m = gradient, x = distance, c = distance when litres is 0)
	400 = (400 / (1500-250)) * 250 + c c = 400 – (-0.32 * 250) c = **480**	
	y = (-0.32 * 2000) + 480 y = **-160**	
So:	200mm = 480 litres 2000mm = -160 litres	(Low Level = 0V output) (High Level = 10V output)

Requirements:

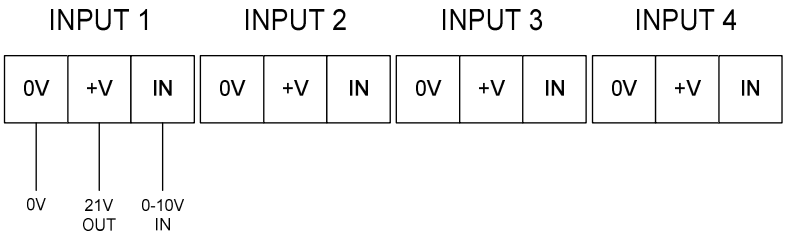
- Two alarm thresholds are required – one to see if the level is too high and one to see if the level is too low. Must alarm if it exceeds 350 litres and if it falls below 50 litres.
- Must alarm to a single number
- Once a week, it should take a log of the tank level reading regardless of the tank level and send it to the same number as the alarms
- Every 12 hours it should check the levels to see if the level has passed an alarm threshold

Configuration:

In this example, we will use the Windows based configuration tool to simplify the process and prevent mistakes being made in the construction of the programming commands. If you wish to understand the construction of the programming commands, please refer to the Programming Specification.

We will use +447771111111 as the primary number – this will be used to receive any alarms and weekly logs.

The ultrasonic sensor is wired into input 1, with the DIL switch set to the 0-10V position.



Example #2 Settings

Entry	Value	Notes
Phone Number 1	+447771111111	Phone Number 1 is always the number that will be transmitted to upon a transmit interval.
Phone Number 2	Leave blank	
Phone Number 3	Leave blank	
Phone Number 4	Leave blank	

Entry	Value	Notes
Unit Name	system_2	
Transmit Interval	10080	60 * 24 * 7 = 10080 Minutes
Wake Up Interval	720	60 * 12 = 720 Minutes
Temperature Enabled	Not Checked	

Parameter	Input 1	Input 2	Input 3	Input 4	Notes
Enabled	Checked				
Input Name	tank_level				
Settle Time	3				Needs 3 seconds to settle
Input Type	0-10V				
Supply Type	21V				
High Value	-160				
Low Value	480				
Hi Hi Level	350				
Hi Level	0				Only two thresholds required
Lo Level	0				Only two thresholds required
Lo Lo Level	50				
Hysteresis	5				
Phone Number 1	Checked				
Phone Number 2	Not Checked				
Phone Number 3	Not Checked				
Phone Number 4	Not Checked				

Notes:

See previous page on calculating the correct high and low values.

The hysteresis value has been set to 5 litres to prevent small variations over multiple readings re-triggering either of the thresholds.

Generated Text Messages

```
oli.1.+447771111111.

oli.2.system_2.10080.720.0.0.

oli.3.1.tank_level.3.1.0.480.-160.50.0.0.350.5.1.0.0.0.
```

Example #3

Tank Level Monitoring with volt free pump-fail contact

A pressure sensor is being used to check the depth of a very large tank. It operates from a 4-20mA 2 wire loop. It has a min/max range of 0m (4mA output) / 10m (20mA output). It requires a settling time of 2 seconds. The tank is 8 metres in height and has a maximum capacity of 14500 litres. A safety pump-fail alarm is also connected – a volt free contact is present that makes contact when the pump has failed

Working:	y = mx + c	(y = litres, m = gradient, x = distance, c = distance when litres is 0)
	14500 = (14500 / 8) * 8 + c c = 14500 – (1812.5 *8) c = **0**	
	y = (1812.5 * 8) + 0 y = **14500**	
So:	0m = 0 litres 8m = 14500 litres	(Low Level = 4mA output) (High Level = 20mA output)

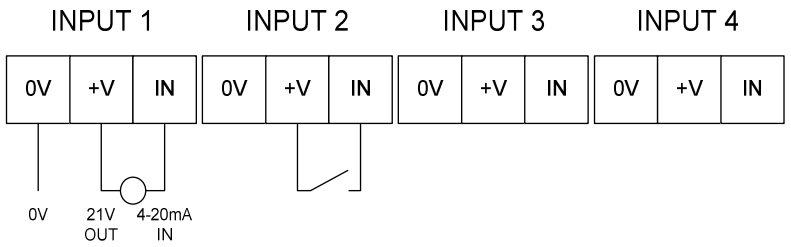
Requirements:

- Two alarm thresholds are required – one to see if the level is too high and one to see if the level is too low. Must alarm if it exceeds 14000 litres and if it falls below 1000 litres.
- Must alarm to two numbers
- Once a week, it should take a log of the tank level reading regardless of the tank level and send it to the first phone number.
- Every 6 hours it should check the levels to see if the level has passed an alarm threshold or if the pump has failed.

Configuration:

We will use +447771111111 and +447772222222 in our example. +447771111111 will be used to receive the weekly log of the input states.

The value '5' for either of the alarms will represent a triggered state, and 0 represents a non-triggered state. The pressure sensor should be wired into input 1 (DIL switch = 4-20mA) and the pump-fail contact into input 2 (DIL switch = 0-10V).



Example #3 Settings

Entry	Value	Notes
Phone Number 1	+447771111111	Phone Number 1 is always the number that will be transmitted to upon a transmit interval.
Phone Number 2	+447772222222	
Phone Number 3	Leave blank	
Phone Number 4	Leave blank	

Entry	Value	Notes
Unit Name	system_3	
Transmit Interval	10080	60 * 24 * 7 = 10080 Minutes
Wake Up Interval	360	60 * 6 = 360 Minutes
Temperature Enabled	Not Checked	

Parameter	Input 1	Input 2	Input 3	Input 4	Notes
Enabled	Checked	Checked			
Input Name	tank_level	pump_fail			
Settle Time	2	1			Needs 2 seconds to settle
Input Type	4-20mA	0-10V			
Supply Type	21V	3.6V			
High Value	14500	29			
Low Value	0	0			
Hi Hi Level	14000	5			
Hi Level	0	0			Only two thresholds required
Lo Level	0	0			Only two thresholds required
Lo Lo Level	1000	0			
Hysteresis	10	0			
Phone Number 1	Checked	Checked			
Phone Number 2	Checked	Checked			
Phone Number 3	Not Checked	Not Checked			
Phone Number 4	Not Checked	Not Checked			

Notes:

See previous page on calculating the correct high and low values.

The hysteresis value has been set to 10 litres to prevent small variations over multiple readings re-triggering either of the thresholds.

Generated Text Messages

```
oli.1.+447771111111.+447772222222.

oli.2.system_3.10080.360.0.0.

oli.3.1.tank_level.2.1.1.0.14500.1000.0.0.14000.5.1.1.0.0.

oli.3.2.pump_fail.1.0.0.0.29.0.0.0.5.0.1.1.0.0.
```

Example #4

Real Time Security Monitoring

A PIR sensor has a volt free contact available – When the PIR senses movement, the metron must immediately pick up the contact and send an alarming message.

Requirements:

- Must alarm to one number
- It should not send a regular log regardless of state
- It must check the signal more than 4 times a second

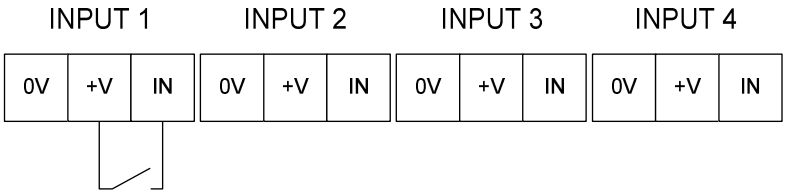
Configuration:

We will use +447771111111 in our example. +447771111111 will be used to receive any alarms that are triggered.

The value '5' for either of the alarms will represent a triggered state, and 0 represents a non-triggered state. The volt free contact should be wired into input 1 (DIL switch = 0-10V).

Because input 1 needs to be continually monitored, you must set the wake up interval to 65535. This causes the metron to continually monitor inputs 1 and 2, and upon either of them going high, take a reading from each channel (if enabled) and process according to the alarm thresholds. The settings are similar to the first example, except for the wake up interval value.

NOTE: When a wake up interval of 65535 is used then only inputs 1 and 2 are activated, and battery life is reduced significantly.



Example #3 Settings

Entry	Value	Notes
Phone Number 1	+447771111111	Phone Number 1 is always the number that will be transmitted to upon a transmit interval.
Phone Number 2	Leave blank	
Phone Number 3	Leave blank	
Phone Number 4	Leave blank	

Entry	Value	Notes
Unit Name	system_4	
Transmit Interval	0	0 = Do not transmit upon interval
Wake Up Interval	65535	65535 = continually monitor inputs ½
Temperature Enabled	Not Checked	

Parameter	Input 1	Input 2	Input 3	Input 4	Notes
Enabled	Checked				
Input Name	PIR_1				
Settle Time	1				Lowest setting = 1
Input Type	0-10V				
Supply Type	3.6V				
High Value	29				
Low Value	0				
Hi Hi Level	5				
Hi Level	0				
Lo Level	0				
Lo Lo Level	0				
Hysteresis	0				
Phone Number 1	Checked				
Phone Number 2	Not Checked				
Phone Number 3	Not Checked				
Phone Number 4	Not Checked				

Notes:

Generated Text Messages

```
oli.1.+447771111111.

oli.2.system_4.0.1.0.0.

oli.3.1.PIR_1.1.0.0.0.29.0.0.0.5.0.1.0.0.0.
```

SPECIFICATION

General:	Number of Channels:	4
	Battery Life:	Typically > 5 Years
	Battery Included:	Yes
	Connectors:	3 Pin 3.81mm Pitch / Sensor
		SMA Antenna Connector
		2.54mm Molex Power Connector
		9 Way D-Type Male (internal use only)
	Warranty:	12 Months RTB
Form Factor:	Enclosure:	IP67 Rated, Polycarbonate
	Dimensions:	180 x 130 x 76 (mm)
	Weight:	~ 0.7 Kg
Electrical:	Operating Frequency:	900/1800/1900Mhz
	Supply:	3.6V @ 0.5A
	Excitation Supply:	~ 3.4V @ < 0.5A / ~ 21V @ < 120mA
	Power consumption (Sleep):	~ 50µA
	Power consumption (Active):	~ 6mA
	Power consumption (Modem):	~ 12 – 250mA
	Input Impedance:	33KΩ (0-10V)
		XXXΩ (4-20mA)
	Input Tolerance:	
	Resolution:	10 bit (1024 Increments)
Environmental:	Temperature:	-15 to +45 ºC
	Humidity:	20 to 80% non-condensing

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BATTERY LIFE

The Metron draws 0.05mA in sleep mode. Switching on the display, the sensors or the modem increase the current draw and therefore reduces battery life. Each text message takes approximately 0.000875 AH. The battery capacity is 14.5AH.

The following example shows 4 sensors (each 2 wire 4-20mA devices) connected to the Metron. The Metron powers the sensors twice per day and sends the readings twice per day.

Standing Current for the Metron	.055	mA
AH per day for standing	.00132	
sensor 1 settling time	1.	secs
sensor 1 current	20.	mA
AH per reading	.000044	
sensor 2 settling time	1.	secs
sensor 2 current	20.	mA
AH per reading	.000044	
sensor 3 settling time	1.	secs
sensor 3 current	20.	mA
AH per reading	.000044	
sensor 4 settling time	1.	secs
sensor 4 current	20.	mA
AH per reading	.000044	
Total AH per reading	.000178	AH
Number of readings per day	2.	
AH per transmission	.000875	AH
Number of transmissions per day	2.	
TOTAL AH PER DAY	.003426	AH
Battery capacity	14.5	AH
Battery life	4,232.890042	days
	604.698577	weeks
	11.63	years

This does not include battery self discharge (3% per annum). It is impractical to quote a battery life of 11 years as shown above but this calculation gives a good guide as to what can be achieved.

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IN4MA Metron

GSM/GPRS Telemetry Solution
Programming Specification
Revision 0.99b 0908

Sept 2008

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Important points to note

- Valid characters are **0-9**, **a-z**, **A-Z**, **+**, **-**, _ and **.**
- Spaces are allowed but not recommended (they are ambiguous), use _ instead
- All text messages and names are case insensitive.
- **.** is used as the separator, and is also used to end the command.
- The Metron does not use phone number identification as an authorisation method. The security for the Metron is a single three digit password.

The text message format

The format of a text message to program the Metron is shown below. [and] are not literal characters, they enclose a description of what is expected. There may be more than one parameter, but this is dependant on the command being issued.

```
[password].[command number].[parameter].
```

Every text message sent to the Metron will only be processed if it begins with the correct three digit password. If this is not the case, no action will be taken. *The default password is 'oli'.*

The command numbers are as followed.

Command Number	Description
1	This is used to program the phone book
2	This is used to configure the system settings
3	This is used to configure the inputs
4	This is used to change the password
5	This is used to reset the system to factory settings
6	This is used to request the configuration and status

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Command Number 1 – Programming the phone book

Description

This command will set up to four of the phone book entries on the Metron.

Format

```
[password].1.[phonenumber1].[phonenumber2].[phonenumber3].[phonenumber4].
```

Example text message

```
oli.1.+447712345671.+447712345672.+447712345673.+447712345674.
```

Parameters

Parameter	Description	Limitations
Phone number	The phone number of a device to transmit to	The phone numbers can be up to 4 to 14 digits in length, including '+'

Notes

You must include the country code e.g. +44.

If you need to set fewer than four phone book entries, use the same format but omit the desired numbers. For example:

```
oli.1.+447712345671.+447712345672.
```

The numbers are programmed into the phonebook in order

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Command Number 2 – Configuration of the system settings

Description

This command will configure the system settings on the Metron.

Format

```
[password].2.[unit name].[transmit interval].[wakeup interval].[temperature enabled].[formatting].
```

Example text message

```
oli.2.pump_house.1440.720.1.1.
```

Parameters

Parameter	Description	Limitations
Unit name	A unique name that identifies the particular Metron	This cannot be more than 20 digits in length
Transmit Interval	How frequently the unit will wake up and transmit readings from the sensors. This will transmit to phone number 1. (Minutes)	This must be between 0 and 65536 Minutes 0 = Do not wake up and send log
Wakeup Interval	How frequently the unit will take up and take measurements from the sensors (Minutes)	This must be between 0 and 65536 Minutes 0 = Do not wake up to check sensors / send alarm 65535 = Continually monitor inputs 1 and 2 for a on/off signal (3.6V Supply Only). Inputs 3 & 4 disabled, battery life shortened.
Temperature Enabled	This enables and disables the transmission of temperature readings from the on-board temperature sensor. This will transmit to phone number 1.	Boolean – Must be 1 (enabled) or 0 (disabled) 0 = Disabled 1 = Enabled
Formatting	This dictates the formatting of the text messages – allows it to be used in conjunction with the SIGMA software and the Gateway. If SIGMA formatting is enabled, the Alarms will be the only functionality on the Metron	Must be 0, 1 or 2 0 = Standard 'User' Formatting 1 = Use SIGMA Formatting (Internal use only) 2 = Use Gateway (Internal use only)

Notes

The formatting option is for use exclusively with Powelectrics SIGMA software and Gateway system.
If you select SIGMA or Gateway functionality, only phone number 1 will be used.

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Command Number 3 – Configuration of the Inputs

Description

This command will configure the inputs on the Metron

Format

```
[password].3.[input number].[input name].[settle time].[supply type].[input type].[low value].[high value].
[lololevel].[lolevel].[hilevel].[hihilevel].[hysteresis].[phone1 enable].[phone2 enable].[phone3 enable].[phone4 enable].
```

Example text message

```
oli.3.1.level_1.1.1.0.0.1000.0.0.0.100.5.1.1.1.1.
```

Parameters

Parameter	Description	Limitations
Input number	The number of the input that you want to configure	Must be 1, 2, 3 or 4
Input name	A name to identify the input	This cannot be more than 20 digits in length
Settle time	The length of time between the power being present on the supply pin of the selected input and it being switched off again	This must be between 1 and 99 Measured in seconds
Supply type	This selects between 3.6V and 21V on the supply pin of the selected input	Boolean – Must be 1 (enabled) or 0 (disabled) 0 = 3.6V DC 1 = ~21V DC
Input type	This selects whether the input pin on the selected input is measured as 0-10V or 4-20mA. The switches on the front must correspond to the programmed state.	Boolean – Must be 1 (enabled) or 0 (disabled) 0 = 0-10V 1 = 4-20mA
Low value	This is the engineering value the Metron will convert 0V or 4mA to for the low level reading	Must be between -32768 and 32767 Cannot be equal to the High Value
High value	This is the engineering value the Metron will convert 10V or 20mA to for the high level reading	Must be between -32768 and 32767 Cannot be equal to the Low Value
lololevel	This is an alarm threshold. When the sensor value drops below	Must be between -32768 and 32767. 0 = disabled

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	this, an alarm will be sent	Must not be equal to any other alarm threshold
lolevel	This is an alarm threshold. When the sensor value drops below this, an alarm will be sent	Must be between -32768 and 32767. 0 = disabled Must not be equal to any other alarm threshold
hilevel	This is an alarm threshold. When the sensor value rises above this, an alarm will be sent	Must be between -32768 and 32767. 0 = disabled Must not be equal to any other alarm threshold
hihilevel	This is an alarm threshold. When the sensor value rises above this, an alarm will be sent	Must be between -32768 and 32767. 0 = disabled Must not be equal to any other alarm threshold
Hysteresis	This is the hysteresis value. Refer to the user manual for clarification and use of this value.	Must be between 0 and 99
Phone1 enable	If phone number 1 should be alarmed to upon an alarm threshold being broken.	Boolean – Must be 1 (enabled) or 0 (disabled) 0 = Do not text phone number 1 upon alarm 1 = Do text phone number 1 upon alarm
Phone2 enable	If phone number 2 should be alarmed to upon an alarm threshold being broken.	Boolean – Must be 1 (enabled) or 0 (disabled) 0 = Do not text phone number 2 upon alarm 1 = Do text phone number 2 upon alarm
Phone3 enable	If phone number 3 should be alarmed to upon an alarm threshold being broken.	Boolean – Must be 1 (enabled) or 0 (disabled) 0 = Do not text phone number 3 upon alarm 1 = Do text phone number 3 upon alarm
Phone4 enable	If phone number 4 should be alarmed to upon an alarm threshold being broken.	Boolean – Must be 1 (enabled) or 0 (disabled) 0 = Do not text phone number 4 upon alarm 1 = Do text phone number 4 upon alarm

Notes

You will need to send a single instance of this command for each input you would like to program (specifying the input number)

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Command Number 4 – Changing the password

Description

This command will change the password

Format

```
[password].4.[new password].
```

Example text message

```
oli.4.pow.
```

Parameters

Parameter	Description	Limitations
New password	This is the password that will replace the current password	It cannot be more than 3 digits in length

Notes

Once you have set this password, the new password will come into effect immediately

Powelectrics can remotely reset your Metron if you have forgotten the password. Contact Powelectrics for more information.

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Command Number 5 – Clearing the configuration

Description

This command will reset all settings on the Metron, including the system password (returns to the default password)

Format

```
[password].5.
```

Example text message

```
oli.5.
```

There are no parameters

Notes

Powelectrics can remotely reset your Metron if you have forgotten the password. Contact Powelectrics for more information.

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Command Number 6 – Requesting Configuration and Status

Description

This command will prompt the Metron upon the next Transmit Interval to send the current configuration and status **to the device that has sent the command** using SMS messaging

Format

```
[password].6.
```

Example text message

```
oli.6.
```

There are no parameters

Notes

It will only respond when the Metron reaches its next Transmit Interval

It will send the SMS message only to the device that sent the command.

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IN4MA Metron

GSM/GPRS Telemetry Solution
Alarm Format Specification
Revision 0.99b 0908

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Important points to note

- The Metron does not use phone number identification as an authorisation method. The security for the Metron is a single three digit password.
- All scaled values are rounded to the nearest whole number.

When the Metron will send a text message

There are four possible triggers that can cause the Metron to send a text message. These are:

- **A Periodic Log** – Every time the transmit interval has elapsed, the Metron will transmit the readings from all of the sensors that are enabled
- **An Alarm** – Every time the wake up interval has elapsed and a reading passes a threshold requirement the reading in question will be transmitted
- **A Status Request** – Upon logging onto the phone network and the reception of command 6, it will transmit the status of all inputs and settings
- **Reset Confirmation** – When the unit has been remotely reset, a confirmation will be sent to the number issuing the command

Each has its own text messaging format, explained on the following pages

How the formats are described.

[and] are not literal characters, they enclose a description of what will be sent, for example:

```
[scaled reading]
```

Periodic Log text message format

Description

Every time the transmit interval is elapsed, the Metron will transmit the readings from all of the sensors that are enabled. **If a particular input is not enabled, the name and reading of the input will simply be omitted.**

Formatting Modes

The formatting of a Periodic Log text message is dependant on the formatting mode in the system settings. It is not possible to operate the Metron in a combination of the formatting styles.

'User' Formatting

```
LOG: [unit name]
[input 1 name]: [scaled reading]
[input 2 name]: [scaled reading]
[input 3 name]: [scaled reading]
[input 4 name]: [scaled reading]
[temperature] C
```

'User' Example

```
LOG: pump_house
tank_1: 50.34
tank_2: 23.01
tank_3: 45.00
tank_4: 64.83
22.125 C
```

Gateway Formatting

```
log,,[input 1 name],[scaled reading]:[input 2 name],[scaled reading]:[input 3 name],[scaled reading]:[input 4 name],[scaled reading]:temperature,[temperature reading]
```

Gateway Example

```
log,,tank_1,50.34:tank_2,23.01:tank_3,45.00:tank_4,64.83:22.125
```

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On Alarm text message format

Description

When a reading from an input is taken at a wakeup interval and it has passed below a threshold that has been set for that input, an alarm will be raised.
Formatting

'User' Formatting

```
ALARM: [unit name]
[triggered input name]: [scaled reading]
```

'User' Example

```
ALARM: pump_house
tank_1: 33.04
```

SIGMA Formatting

```
ALARM,00/00/00,00:00:00,000000000000001,000000N,0000000E,000,00001,>Trig,00,0A,00/00/00,00:00:01,0000,C[input number],DI 2
```

SIGMA Example

```
ALARM,00/00/00,00:00:00,000000000000001,000000N,0000000E,000,00001,>Trig,00,0A,00/00/00,00:00:01,0000,C2,DI 2
```

Gateway formatting

This is sent in the same format as a log message to the Gateway

Notes

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Status Request text message format

Description

Upon logging onto the phone network and the reception of command 6, it will transmit the status of all inputs and settings. It will send the text message to the number that originally sent the command.

Formatting

```
STATUS: [unit name]
[input 1 name]: [scaled reading]
[input 2 name]: [scaled reading]
[input 3 name]: [scaled reading]
[input 4 name]: [scaled reading]
[temperature] C
```

Notes

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Reset Confirmation text message format

Description

When the unit has been remotely reset, a confirmation will be sent to the number issuing the command

Formatting

```
Reset Successful
```

Notes

If the remote reset has not been successful for any reason, there will not be a confirmation of any kind.

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